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B.H. Moody and H.F. Cerezke

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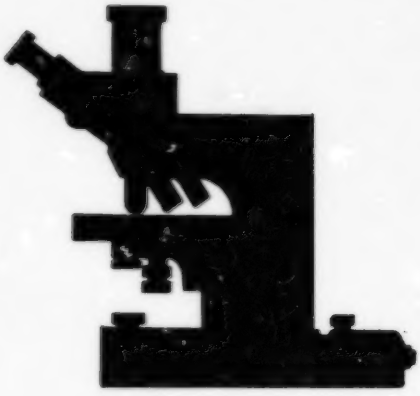

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FOREST INSECT AND DISEASE CONDITIONS IN ALBERTA, SASKATCHEWAN, MANITOBA, AND THE NORTHWEST TERRITORIES IN 1983 AND PREDICTIONS FOR 1984

B.H. MOODY AND H.F. CEREZKE

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ABSTRACT

Forest pest conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories during 1983 are summarized, and some predictions are made for 1984. Eleven major pests are discussed in detail, and additional noteworthy insects, diseases, and other damage agents are reported in a table. Spruce budworm outbreaks continued to increase in white spruce-balsam fir stands in the region. In Manitoba, moderate-to-severe defoliation increased to 66 000 ha from 34 600 ha in 1982. The jack pine budworm infestation in Manitoba increased, and moderate-to-severe defoliation of jack pine occurred over 146 000 ha. Infestations of the mountain pine beetle decreased and occurred within the same areas as in 1982. About 250 000 lodgepole pine were killed, mainly in southwestern Alberta. Mortality of mature white spruce caused by the spruce beetle was reported in several small areas in northern Alberta. Dutch elm disease continued to spread in rural Manitoba. In both urban and rural municipalities, 2383 elm trees were identified as infected.

RESUME

La situation de l'infestation des forêts par les insectes nuisibles, en Alberta, en Saskatchewan, au Manitoba et dans les Territoires du Nord-Ouest, en 1983, est résumée, et quelques prédictions sont faites pour 1984. Onze ravageurs importants sont traités en détail, tandis qu'un tableau est consacré aux insectes, aux maladies et aux autres facteurs de dommage dignes de mention. La tordeuse des bourgeons de l'épinette a gagné du terrain dans les peuplements d'épinette blanche et de sapin baumier. Au Manitoba, les 34 600 ha modérément à gravement défoliés en 1982 sont passés à 66 000 ha, tandis que la tordeuse du pin gris agrandissait son domaine à plus de 146 000 ha modérément à gravement défoliés. Le dendroctone du pin ponderosa a régressé, en se cantonnant dans les mêmes régions qu'en 1982. Environ 250 000 pins tordus ont été tués, surtout dans le sud-ouest de l'Alberta. Une mortalité de l'épinette blanche rendue à maturité, causée par le dendroctone de l'épinette, a été signalée dans plusieurs petites zones du nord de l'Alberta. La maladie hollandaise de l'orme a continué de s'étendre dans les campagnes manitobaines. Dans le municipalités urbaines et rurales, 2383 ormes ont été signalés comme infectés.

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INTRODUCTION

This report summarizes forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories in 1983 and provides predictions of the infestation levels of major insect pests for 1984. Surveys were conducted mainly by the staff of the Forest Insect and Disease Survey (FIDS) of the Northern Forest Research Centre, Canadian Forestry Service (CFS), with the cooperation of personnel from many federal, provincial, and municipal agencies.

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Alberta Agriculture
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Alberta Recreation and Parks
City of Edmonton
City of Prince Albert
City of Saskatoon
Department of Northern Saskatchewan
Manitoba Agriculture
Manitoba Department of Natural Resources
Parks Canada
PFRA Tree Nursery
Saskatchewan Agriculture
Saskatchewan Department of Tourism and Renewable Resources
Canada Department of Indian Affairs and Northern Development

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Five summer students (Joe Helwig, Wayne Jansen, Tarra Kongsrude, Candace Liard, and Margaret Smith) also worked for FIDS in 1983.

The following descriptions of pests are arranged more or less according to national and regional importance. Brief remarks on other noteworthy insects, diseases, and vegetation disturbances appear in the table on pages 15-19.

SPRUCE BUDWORM
Choristoneura fumiferana (Clemens)

Spruce budworm outbreaks continued to increase in white spruce-balsam fir stands in Manitoba, Saskatchewan, Alberta, and the Northwest Territories in 1983 (Fig. 1). These outbreaks were scattered over a total area of 66 000 ha compared to 34 600 ha in 1982 (Table 1). No sizeable control measures were carried out against the spruce budworm in the region. The general forecast for 1984, based on egg-mass counts in September 1983, is for moderate-to-severe defoliation to occur in the same general areas.

Table 1. Summary of moderate-to-severe defoliation by the spruce budworm sketch-mapped from the air during 1982-83

Area	Defoliation (ha)		
	1982	1983	Difference
Manitoba	31 380	40 500	+9 500
Saskatchewan	2 000	12 700	+10 700
Alberta	600	1 000	+400
Northwest Territories	1 000	11 800	+10 800
Total	34 980	66 000	+31 400

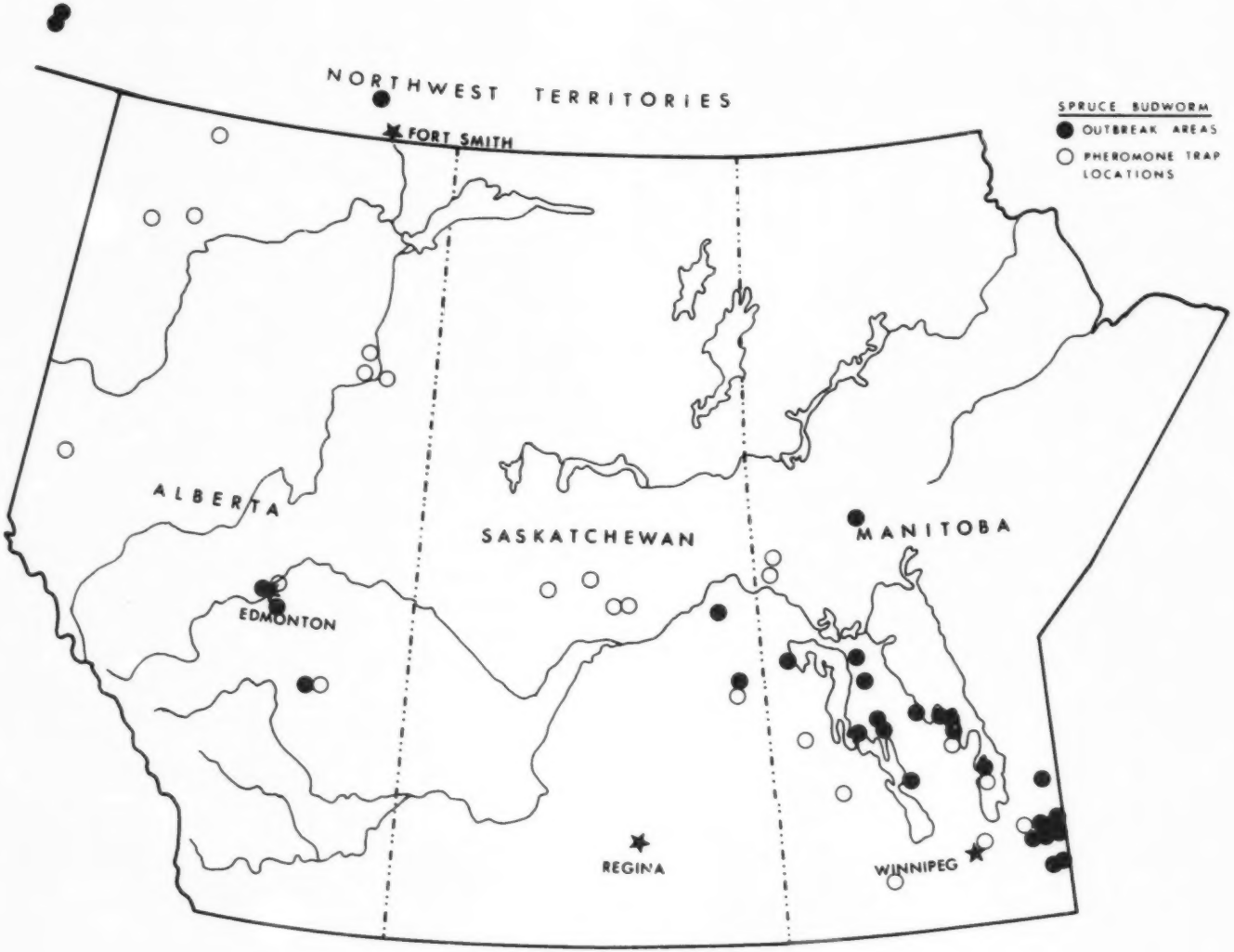

Figure 1. Areas of moderate-to-severe defoliation by the spruce budworm in 1983 and the locations of spruce budworm pheromone traps.

Manitoba: The number of spruce budworm infestations increased, and moderate-to-severe defoliation occurred in white spruce-balsam fir stands scattered over an area of 40 500 ha compared to 31 380 ha in 1982; however, 9500 ha of this area were surveyed for the first time in 1983 but were apparently infested in 1982. Tree mortality (<25%) is now scattered over 3000 ha of spruce-fir stands weakened by repeated defoliation in the St. George Lake area and in Hecla and Whiteshell provincial parks. In the latter area, balsam fir mortality increased to about 90% in certain stands.

In the Interlake Region, moderate-to-severe defoliation was fairly widespread from the Sturgeon and Kinwow bays of Lake Winnipeg through the St. George Lake area to the Moose and Matheson islands near Fisher Bay. Defoliation of scattered host stands occurred over a composite area of 10 000 ha. Similar defoliation occurred in Hecla Provincial Park (1200 ha), Grindstone Point Provincial Park (5000 ha), the Sisib-Chitek lakes area (500 ha)[1], the Waterhen-Proulx lakes area (8000 ha)[1], and between Anderson Lake and the Dauphin River (1500 ha)[1]. Light-to-moderate defoliation occurred on 10 ha near Moosehorn.

East of Lake Winnipeg, moderate-to-severe defoliation of white spruce and balsam fir was observed in Whiteshell Provincial Park, along the Winnipeg River systems between Otter Falls and Slave Falls. Extensive moderate-to-severe defoliation was also recorded in the Whiteshell, Little Whiteshell, Lone Island, and Crowduck lakes areas. Ground surveys indicated pockets of similar defoliation, mainly on white spruce, at West Hawk Lake (main resort area) and 8 km west of the Falcon Lake townsite. The total area with moderate-to-severe defoliation within Whiteshell Provincial Park was 10 000 ha. In Nopiming Provincial Park, moderate-to-severe defoliation occurred along the south side of Bird Lake, with scattered pockets (3000 ha) of similar defoliation westward along Bird River to the Lac du Bonnet and Lac du Bois areas. Moderate-to-severe defoliation was reported 10 km east of Bissett.

In the northern region moderate-to-severe defoliation of white spruce and balsam fir was recorded again over 80 ha at the Grass River provincial campsite on the west side of Wekusko Lake. This infestation has persisted for several years and contributed to bud and shoot damage and reduced growth of balsam fir. Elsewhere, moderate-to-severe defoliation occurred on 300 ha at the junction of the Red Deer River and Dawson Bay.

Egg-mass counts at 51 locations and pheromone trapping for male moths at 10 locations in Manitoba indicate that moderate-to-severe defoliation may occur in 1984 within the same area of infestation as in 1983 (Table 2). Weather, parasites, predators, and diseases may affect the predicted infestation levels.

Saskatchewan: In 1983, spruce budworm infestations increased, and moderate-to-severe defoliation of white spruce stands occurred over a total of 12 700 ha compared to 2000 ha in 1982.

In 1982, the first major spruce budworm outbreak in Saskatchewan since 1968 was recorded near Usherville in east-central Saskatchewan. This outbreak more than doubled in size in 1983, when moderate-to-severe defoliation of predominantly white spruce stands occurred over 4800 ha. A new spruce budworm outbreak near Red Earth was detected and mapped by forestry personnel of the Saskatchewan Department of Tourism and Renewable Resources (SDTRR). Moderate-to-severe defoliation of predominantly white spruce stands was scattered over 7900 ha. There was also evidence of light defoliation in 1982.

Timber harvesting has been redirected to areas of severe defoliation near Red Earth to reduce potential losses in the budworm-infested stands. Egg-mass counts in four locations within the two major outbreak areas indicate that moderate-to-severe defoliation will likely occur in both areas in 1984.

Alberta: Spruce budworm infestations intensified in scattered white spruce stands in central Alberta. Moderate-to-severe defoliation of white spruce intensified in Edmonton along the North Saskatchewan River and spread to trees in adjacent residential areas. Moderate-to-severe defoliation occurred for the second year in white spruce stands near Castor (200 ha) and at Big Knife Provincial Park (8 ha). Infestations with similar defoliation were recorded near Millet (250 ha) and the Dubois Valley area near Big Knife Provincial Park (100 ha). Examination of foliage indicated that the severe infestation near Millet probably started in 1981.

[1] Areas not flown or surveyed in 1982.

Table 2. Average spruce budworm egg-mass densities in 1983 and predicted 1984 damage for Manitoba, Saskatchewan, and Alberta

Location	Egg mass per 10 m² of foliage	1984 damage forecast[a]
MANITOBA		
Interlake region		
Moosehorn	6 (28)[b]	Light
Waterhen	540 (314)	Severe
Lake St. George (6 locations)	114 (236)	Moderate
Lake St. Andrew (4 locations)	132 (68)	Moderate to severe
Southeastern Manitoba		
Lac du Bonnet	— (654)	—
Bird Lake, Tahabi Falls	143 (420)	Moderate to severe
Bisset	— (466)	—
Belair Provincial Forest	0	Nil
Whiteshell Provincial Park		
Junction Hwy. 309 and 307	— (142)	—
Big Whiteshell Lake area	294 (592)	Severe
11 locations[c]	286 (371)	Severe
Hecla Island Provincial Park		
(11 locations)[c]	206 (415)	Severe
Grindstone Point Provincial Park		
(7 locations)[c]	141 (170)	Moderate to severe
Birds Hills Provincial Park	6	Light
Spruce Woods Provincial Park	0	Nil
Duck Mountain National Park	0	Nil
Northern Manitoba		
Wekusko Lake	481 (304)	Severe
Riding Mountain National Park (3 locations)	0 (1.2)	Nil
SASKATCHEWAN		
Near Usherville	221	Severe
Red Earth	459	Severe
ALBERTA		
Edmonton	96	Moderate
Millet	1661	Severe
Duhamel Campground	22	Light
Dubois Valley	372	Severe
Big Knife Provincial Park	175 (106)	Moderate to severe
Castor	550 (304)	Severe

[a]Egg mass per 10 m² and potential defoliation:
Light = Up to 25 = >25% defoliation
Moderate = 50-100 = 26-50% defoliation
Severe = 200+ = 50+% defoliation.

[b]Figures in brackets are for 1982.

[c]Source: Beaubien, Y. 1983. Spruce budworm egg mass survey, 1983. Manit. Dep. Nat. Resour., For. Branch. Winnipeg, Manit. Rep. 83-4.

Egg-mass counts and numbers of male moths caught in pheromone-baited traps within the infested areas indicate that moderate-to-severe defoliation will likely occur in 1984. The average number of egg masses per 10 m^2 of spruce foliage was 550, 175, 372, 22, 1661, and 96 at Castor, Big Knife Provincial Park, the Dubois Valley area, the campground at Duhamel, Millet, and Edmonton, respectively (Table 2).

Northwest Territories: The Liard River (Nahannie Butte) spruce budworm outbreak increased from 1000 ha in 1982 (erroneously reported as 100 ha in 1982 reports) to about 10 600 ha in 1983. New infestations caused moderate-to-severe defoliation of white spruce on a gross area of 1200 ha on Long Island and the adjacent valley of the Slave River, about 105 km north of Fort Smith. No egg-mass survey was conducted but the outbreak will likely continue in 1984.

Pheromone Trapping: For the second year, spruce budworm populations throughout the prairie provinces were monitored by use of pheromone-baited traps for male moths. Traps were deployed in white spruce or white spruce-balsam fir stands at 27 locations: 11 in central and northern Alberta, 6 in central Saskatchewan, and 10 across Manitoba (Fig. 1). Male moths were recovered from traps at all locations but were in high numbers in the outbreak areas only. At other locations the numbers of moths captured were low and indicated small endemic populations, except in Birds Hill Provincial Park, Manitoba, where they indicate light defoliation could occur.

JACK PINE BUDWORM
Choristoneura pinus Freeman

In **Manitoba**, the infestations observed in 1982 north of Grand Rapids increased considerably in 1983. Jack pine stands within a total area of 146 000 ha were moderately to severely defoliated from Grand Rapids north to Little Limestone and Williams lakes, westward to Cedar Lake, and throughout the Moose Lake area (Fig. 2). Elsewhere, moderate-to-severe defoliation of jack pine was observed for the first time in the Halfway and Morgan lakes area northwest of Reed Lake (1500 ha), between Westray and The Bog (2000 ha), between Kawinaw and Pickerel lakes (5000 ha), and at the northern tip of Long Point south of Grand Rapids.

Results of an egg-mass survey on 10 locations in the Grand Rapids area to the vicinity of Little Limestone Lake indicate similar defoliation will occur in 1984 (Table 3). Weather, parasites, and the lack of male flowers (the preferred food of young larvae) can affect these predicted infestation levels.

In **Saskatchewan**, surveys in the Nisbet and Torch River provincial forests revealed no increases in the jack pine budworm population in 1983. The previous outbreaks in these areas collapsed in 1980. The jack pine budworm has not been recorded in **Alberta**.

ASPEN DEFOLIATORS
Primarily the forest tent caterpillar (*Malacosoma disstria* Hübner) and the large aspen tortrix (*Choristoneura conflictana* (Walker))

Aerial and ground surveys indicated that the total area of aspen forests severely defoliated in 1983 declined substantially in Alberta and Saskatchewan but stayed the same in Manitoba. Moderate-to-severe defoliation of aspen and other deciduous tree species was mapped over a gross area of 4 850 000 ha in the region (Fig. 3), two-thirds of which occurred in the agricultural zones.

The forest tent caterpillar was again the major defoliator species across the region, except in the Northwest Territories and Wood Buffalo National Park, where large aspen tortrix predominated. The Bruce spanworm, *Operophtera bruceata* (Hulst), the early aspen leaf curler, *Pseudexentera oregonana* (Walsingham), and a green fruitworm, *Orthosia hibisci* (Guenée), were present but caused little defoliation.

In **Manitoba**, moderate-to-severe defoliation of aspen and other deciduous tree species caused by the forest tent caterpillar occurred over much the same area as in 1982 (600 000 ha), except for a slight spread eastward from the Manitoba-Saskatchewan border. Aerial surveys indicated fairly continuous moderate-to-severe defoliation from Flin Flon southward to Dawson Bay at Lake Winnipegosis and eastward to Moose, Cormorant, and Iskwasum lakes. Scattered areas of aspen with similar defoliation were observed along the north side of Reed Lake, between Talbot and Hargrave lakes, and William and Little Limestone lakes (Fig. 3). The general forecast for 1984, based on egg-band counts conducted by the Manitoba Department of Natural Resources, is for moderate-to-severe defoliation to occur within the same area as in 1983. Population levels are expected to remain low in the Interlake and western regions of Manitoba.

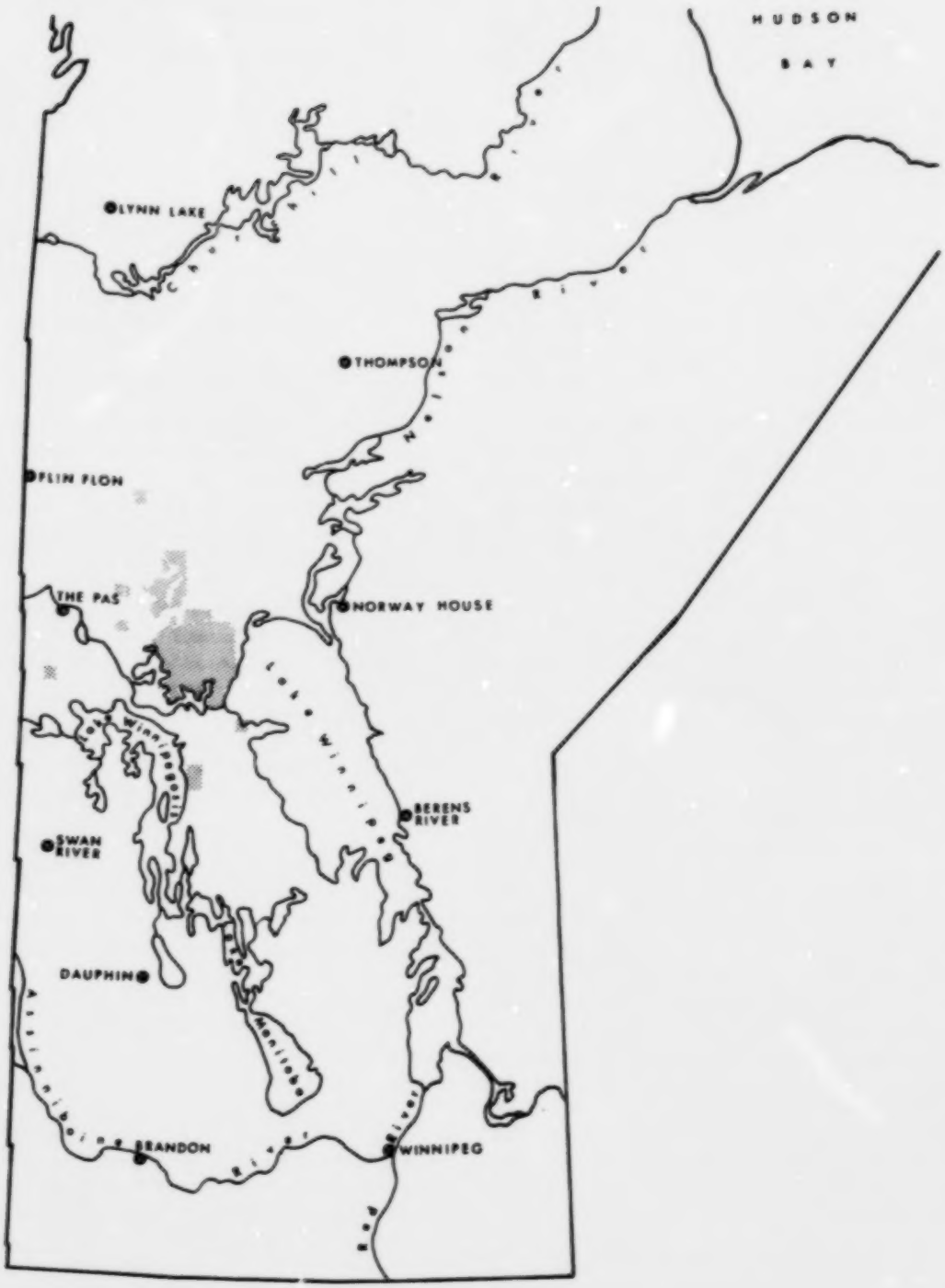

Figure 2. Areas of moderate-to-severe defoliation by jack pine budworm in Manitoba during 1983.

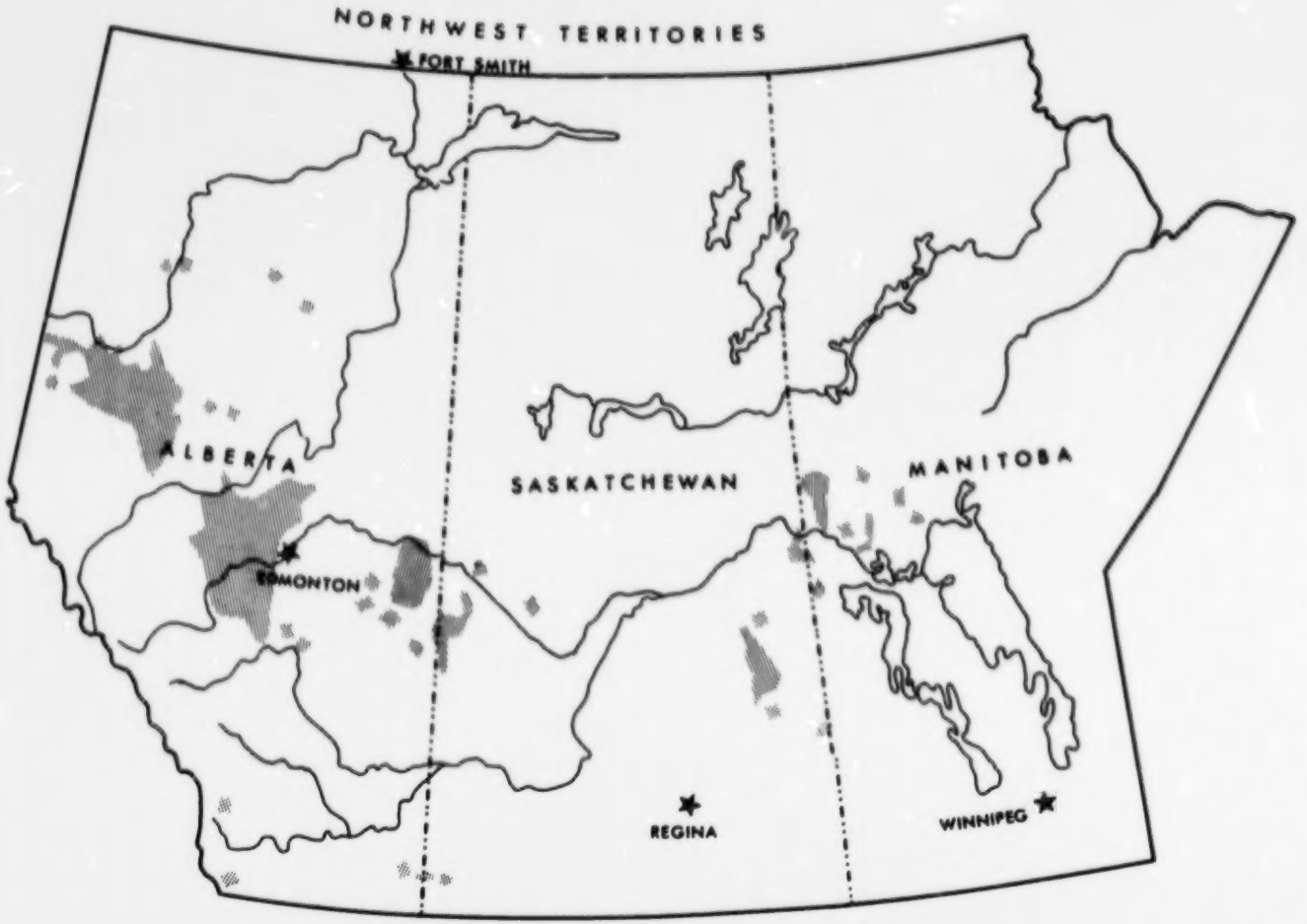

Figure 3. Areas of moderate-to-severe defoliation of trembling aspen primarily by the forest tent caterpillar and large aspen tortrix in 1983, determined by aerial and ground surveys.

Table 3. Results of the 1983 jack pine budworm egg-mass survey in Manitoba and 1984 forecast

Location	Avg no. of egg masses per 10 m^2	Predicted defoliation for 1984
North of Grand Rapids		
Plot 1	81	Moderate
Plot 2	35	Light to moderate
Plot 3	86	Moderate
Plot 4	191	Moderate to severe
Plot 5	131	Moderate to severe
Plot 6	182	Moderate to severe
Plot 7	67	Moderate
Plot 8	34	Light to moderate
5 km south of Grand Rapids	51	Moderate
13 km south of Grand Rapids	33	Light to moderate
Rosenburg fire tower area (north of Arborg)	0	Nil
3 km south of Marchand Ranger Station	0	Nil

In **Saskatchewan**, the decline in forest tent caterpillar, which started in 1980, continued. In 1983, moderate-to-severe defoliation of aspen was mapped over an area of 350 000 ha compared to 2 100 000 ha in 1982. This area includes 70 000 ha of commercially zoned aspen forest in east-central Saskatchewan and aspen scattered widely over 280 000 ha in noncommercial forests, parks, and semiagricultural areas (Fig. 3). Although the forest tent caterpillar was the primary defoliator in east and west-central Saskatchewan, the large aspen tortrix was the primary defoliator of aspen in the Cypress Hills. Minor, widely scattered outbreaks of the Bruce spanworm occurred in the Turtleford-Livelong area, while scattered, light leaf-rolling damage by the early aspen leaf curler was generally observed across the province.

The forest tent caterpillar forecast for 1984, based on egg-band counts in October 1983 at 40 locations across central Saskatchewan, is for a further decline in populations; however, some moderate-to-severe defoliation may occur in Greenwater Provincial Park and in the Porcupine Plain, Lintlaw, Endeavour, Fishing Lake, and Macklin areas in central Saskatchewan.

In **Alberta**, an estimated area of 3 998 000 ha of continuous and scattered aspen stands were moderately to severely defoliated by the forest tent caterpillar compared to 13 000 000 ha in 1932, a decline of 70% in area in 1983. The current infestation is composed of three main outbreak areas centrally located in the province. One outbreak area centers around Valleyview, another is west of Edmonton, and the third and smallest is west of Lloydminster. Due to the decline in insect populations, defoliation was not as complete as in previous years. Egg-band surveys were conducted at 72 locations to forecast forest tent caterpillar population levels in 1984. The trend is for continued decline in populations, and only 17% of the sampled locations are forecasted to have severe defoliation in 1984.

In southern Alberta, defoliation of aspen was caused primarily by the large aspen tortrix, which severely defoliated areas in the Porcupine Hills (28 000 ha), in Waterton Lakes National Park (520 ha), and in Cypress Hills Provincial Park (18 700 ha)

In the **Northwest Territories**, the infestation of aspen by the large aspen tortrix continued to decline. Light defoliation of aspen was recorded in scattered areas between Enterprise and Hay River in the Northwest Territories and in the southern portion of Wood Buffalo National Park in Alberta.

MOUNTAIN PINE BEETLE
Dendroctonus ponderosae Hopkins

Infestations of the mountain pine beetle in Alberta, southwestern Saskatchewan, and the Rocky Mountain national parks in 1983 occurred in most of the same areas as in 1982, and no new infestations outside these areas were detected (Fig. 4). Infestations in numerous scattered stands of limber pine within the Porcupine Hills and adjacent areas in Alberta intensified substantially in 1983.

Provincial forest lands: Mortality of lodgepole pine in 1983 occurred in over 500 infestations within an estimated 2600 ha distributed mostly south of the Crowsnest River in southwestern Alberta (Fig. 4). Within the 2600 ha an estimated 236 600 stems (equivalent to a volume of 78 090 m^3) were killed by the beetle as a result of 1982 attacks. This represents a decrease of nearly 60% over the volume reported in 1982 within the same outbreak area. In areas extending north from the Crowsnest River, including the Porcupine Hills and along the east Livingstone Range, an additional estimated 4000 lodgepole pine and 6000 to 10 000 limber pine were detected in 1983 (1982-attacked). A small area of provincial forest lying at the east margin of Waterton Lakes National Park, known as Pole Haven, had an estimated 1350 recently (1982-attacked) killed trees.

Since 1980 the Alberta Forest Service has maintained a control program of selective sanitation cutting to remove all beetle-infested trees north of the Crowsnest River. This program was continued in 1983 with removal of most of the infested lodgepole pine and about 1400 of the infested limber pine trees. Further accelerated cutting will continue in 1984 to reduce the beetle spread potential from the expected increased numbers of 1983-attacked limber pine.

Salvage operations were continued also by the Alberta Forest Service in stands heavily damaged by the mountain pine beetle south of the Crowsnest River. To date over 200 580 m^3 of affected lodgepole pine have been harvested since 1980.

Provincial parks: Infestations in provincial parks in the Cypress Hills of southwestern Saskatchewan and southeastern Alberta continued in the same areas as reported in 1982. A total of 260 red-topped trees were identified during aerial surveys over the Saskatchewan portion of the Cypress Hills in 1983, of which about 200 were suspected to be killed by mountain pine beetles.

On the Alberta portion of the Cypress Hills about 300 red-topped trees were identified. Both provinces have carried out control programs by selective cutting and burning of infested trees since 1980. During the winter of 1982-83 about 2000 and 1600 trees were treated in Saskatchewan and Alberta. Based upon late 1983 surveys conducted by the two provinces, an additional 3000 pines are likely to require control treatment in 1984.

Elsewhere in Alberta, six small infestations (1982-attacked) were identified in Beauvais Lake Provincial Park, and about 130 trees (1983-attacked) were identified in Kananaskis Provincial Park and adjacent area; all of the latter 130 trees were cut and burned in late 1983.

National parks: The number of trees killed in Yoho National Park declined for the third consecutive year. The decline was from about 1500 trees in 1981 and 710 trees in 1982 to 320 trees in 1983. In Kootenay National Park there were an estimated 2400 recently killed trees in 1981, 3400 in 1982, and about 1230 in 1983. Within Kootenay National Park about 560 of the 1982-attacked trees were distributed from Pitts Creek to the south end of the park, and about 670 trees were found within the area from Pitts Creek north to Mt. Wardle. The latter estimate was 82% of the number of trees that had been predicted to occur, based upon a late September 1982 ground survey.

Within Banff National Park, about 130 trees (1982- and 1983-attacked) were identified near the southern end of the park; all were removed during 1983 as part of a sanitation control program maintained by Parks Canada. An additional 81 trees were removed in Kootenay Park, some near Hector Gorge and the remainder about 1 km north of Kootenay Crossing.

In Waterton Lakes National Park most infestations were small and occurred at the east end of the park, along the valleys of Cameron Creek and Blackiston Creek. The total estimated mortality (1982-attacked) was 6940 trees, which occurred in over 200 individual infestations and included about 1750 recently killed trees on the adjacent Blood Indian Reserve.

No infestations were found in Jasper National Park and no reports were received of mountain pine beetle-attacked planted pines in urban and rural areas of southern Alberta.

Special surveys to monitor the survival of overwintering populations of the mountain pine beetle were

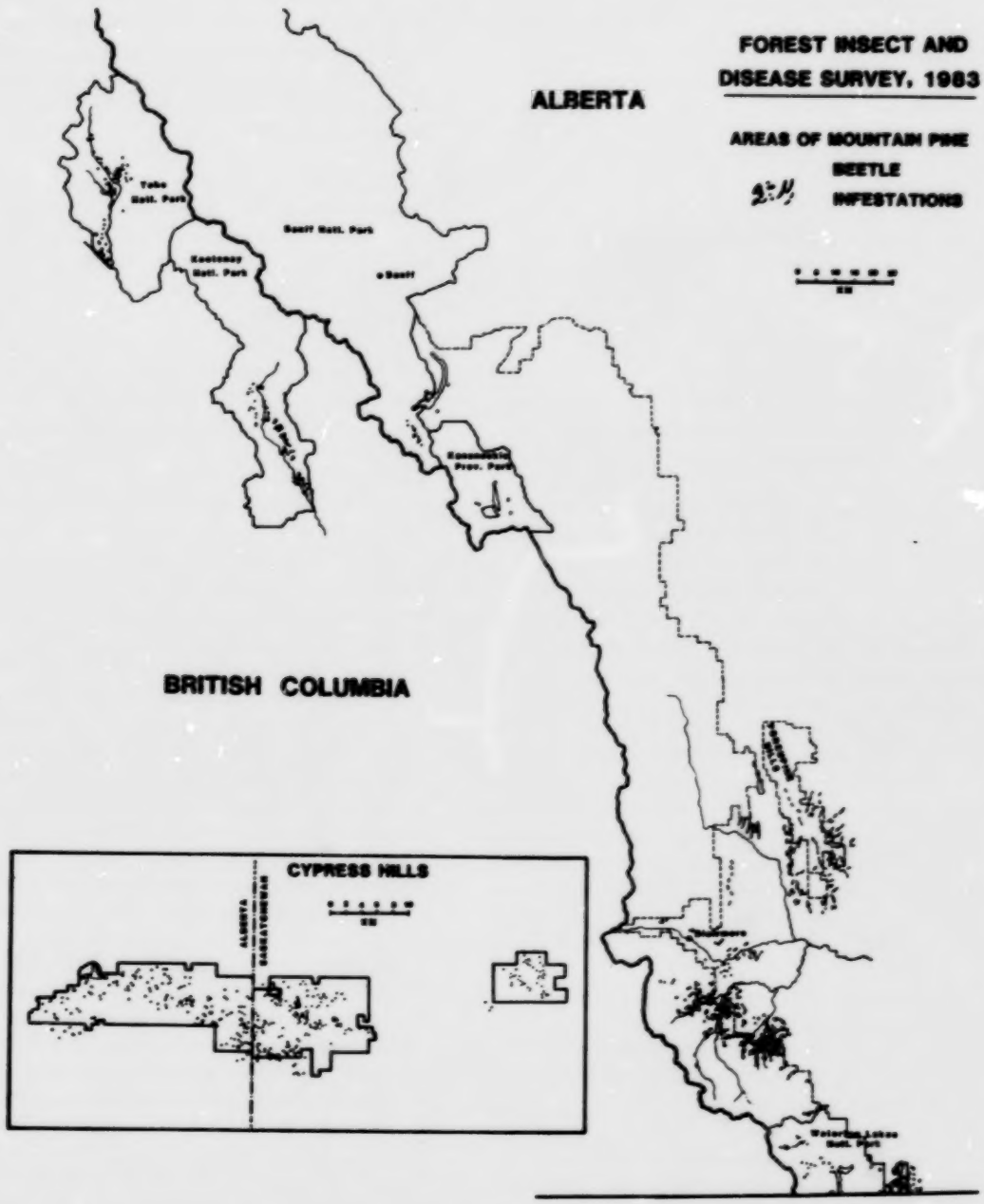

Figure 4. Areas of mountain pine beetle infestations in southwestern Alberta and the Cypress Hills on the Alberta-Saskatchewan border in 1983.

conducted at several locations during late May and early June. Numbers of surviving larvae and adult beetles were sufficiently high at several locations to be indicative of expanding populations. Adult beetles accounted for an overall 15% of the surviving population from Kootenay and Waterton Lakes national parks and the Cypress Hills and resulted in an early beetle flight in late June and early July.

A commercially prepared lure containing semiochemicals (behavior-modifying chemicals) of the mountain pine beetle was field-tested by provincial agencies on a large scale in the Cypress Hills and in southwestern Alberta. The lures (a total of 900) were distributed within areas designated for control to evaluate their potential in detection, monitoring, and control of the beetle. A preliminary assessment indicates that the overall baiting experiment was beneficial in the control programs by concentrating large numbers of beetles into designated areas for efficient tree removal.

SPRUCE BEETLE
Dendroctonus rufipennis (Kirby)

Under normal conditions the spruce beetle is present in small numbers in windthrown spruce trees and fresh stumps but has the potential of becoming a major pest of mature spruce trees. Low populations of this beetle are currently causing light tree mortality (1-2%) annually in mature and overmature spruce stands in southwestern **Alberta**. The Alberta Forest Service conducted surveys of active beetle populations on the west side of the Blairmore District in the Bow-Crow Forest in the same 18 areas as in 1982. When compared to 1982, no significant change occurred in the number of infested trees in 1983, and the beetle population remained stable. A few 1983 beetle-attacked large spruce trees were also found on the east slope of the north end of the Porcupine Hills and near Watridge Lake in the Spray Valley.

In northern Alberta 1500 ha of mature and overmature white spruce forest were reported to have high mortality (up to 70% of the trees in a few stands) during the past 4-6 years. Most severe infestations occurred in stands along the Chinchaga River, near Rainbow Lake, and along the Peace River near the west boundary of Wood Buffalo National Park. At several locations along the Chinchaga River a gross area of 280 ha of white spruce sustained 10-70% tree mortality. The stand of white spruce near Rainbow Lake townsite encompasses 800-1000 ha and contains a total volume of 214 600 m^3, of which about 64 380 m^3 have been killed by spruce beetle. Heavy windthrow of trees in the mid-1970s likely provided initial breeding sites for the beetle population increase. Patches of beetle-killed spruce (one to three trees) occurred in the Watt Mountain area and along the Peace River from Wood Buffalo National Park to Carcajou. Endemic populations were also present in several areas southeast of Hay and Zama lakes and in the Naylor Hills northwest of Manning. Spruce beetle numbers are currently at low levels in all areas. No control treatment is planned except for the prioritization of moderately to heavily damaged stands for accelerated salvage cutting.

DUTCH ELM DISEASE
Ceratocystis ulmi (Buisman) C. Moreau

Dutch elm disease (DED) is a serious tree problem of native and planted white elms in **Manitoba**. It has infected one elm in Saskatchewan in 1981 but has not been detected in Alberta. According to the Manitoba Department of Natural Resources, DED continued to intensify and spread within the range of native and planted elms in rural Manitoba in 1983 (Fig. 5). Localized infections of the disease were detected in five new municipalities: Roland, Louise, Westbourne, Odanah, and Rosedale. In addition, a single infected native white elm tree was identified in Riding Mountain National Park about 6.4 km west of the settlement of Norgate in the adjacent rural municipality of McCreary. Elsewhere, the incidence of diseased trees remained high in native elm stands along the river systems in the eastern and south-central parts of the province. There was also a notable expansion of the outbreak into farmstead shelterbelts, where occasionally both white elm and Siberian elm were infected. In Winnipeg and Brandon, the number of diseased trees decreased from 1115 and 286 in 1982 to 798 and 137 in 1983. In and around urban and rural municipalities, including Winnipeg and Brandon, a total of 2383 elm trees or 53% of the trees examined in the control areas were infected with DED.

The Manitoba DED program is directed toward control of the disease in cities and towns. No control attempts are being made in rural areas, where elms continue to die unchecked, because of the large numbers of elms involved and the difficult access along rivers and streams. The primary vector of the disease in Manitoba is the native elm bark beetle (*Hylurgopinus rufipes* (Eichhoff)). A few specimens of the other vector, the European elm bark beetle (*Scolytus*

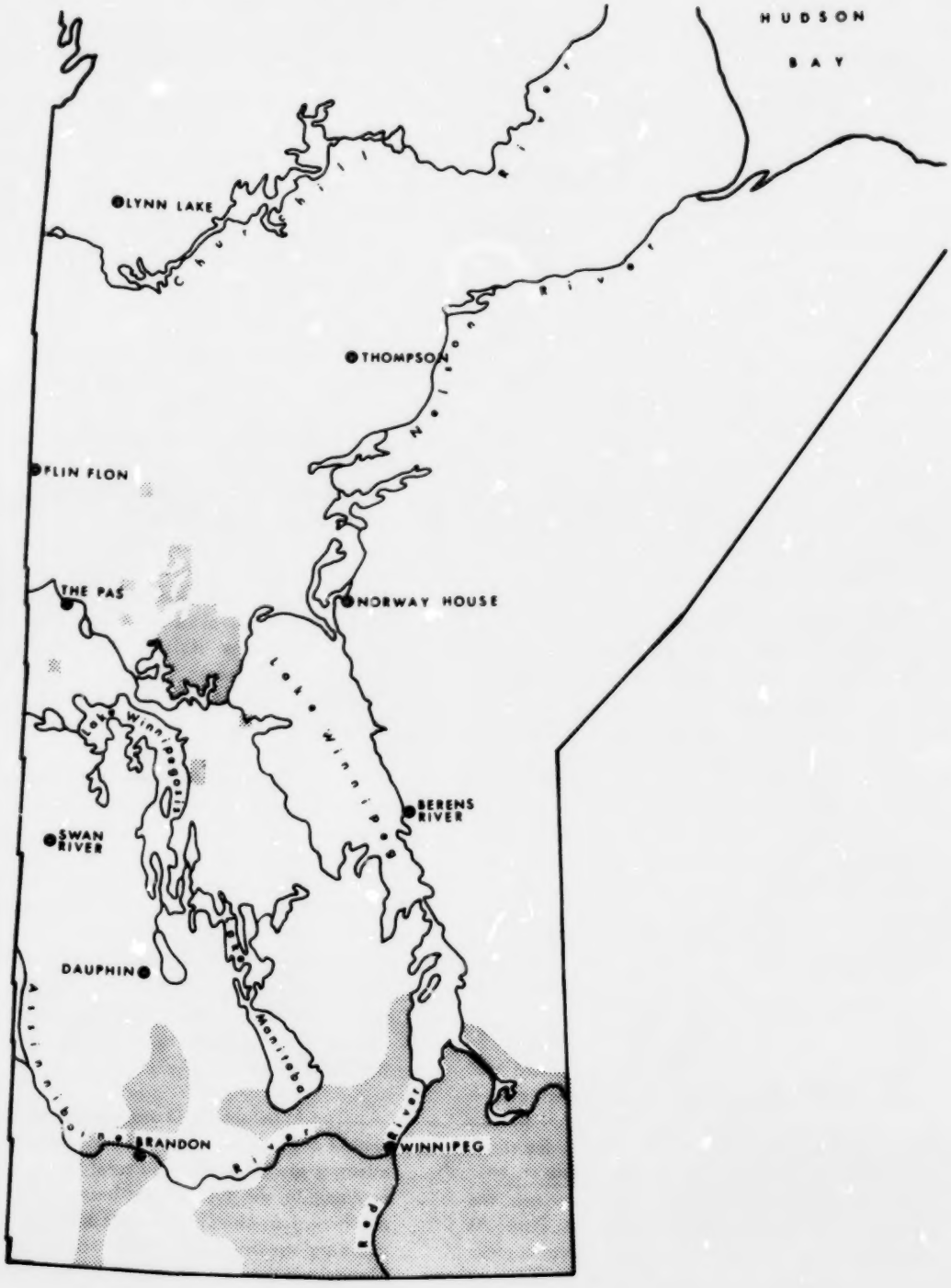

Figure 5. Areas of Dutch elm disease infections in Manitoba in 1983.

multistriatus (Marsham)), were trapped during 1983 on pheromone lures set out in Winnipeg.

In **Saskatchewan**, the Prairie Farm Rehabilitation Administration and the Saskatchewan Department of Parks and Renewable Resources have conducted intensive surveys to detect DED in the province. In 1981, a single confirmed DED-infected tree was removed in Regina, but no new infections have been detected since. No European elm bark beetles were found in pheromone-baited traps in 1983.

In **Alberta**, surveys by Alberta Agriculture and FIDS using baited traps and tree bolts indicate that neither the disease nor the two insect vectors occur in Alberta.

DWARF MISTLETOES
Arceuthobium americanum Nuttal ex Engelmann on jack and lodgepole pines and *A. pusillum* Peck on white and black spruces

Dwarf mistletoes on pines and spruces are a perennial problem in the prairie provinces. The dwarf mistletoe on jack pine and lodgepole pine is a parasitic plant that causes witches' brooms, stem deformation, reduced growth, and possible tree mortality.

In northeastern **Alberta**, recent wildfires burned over extensive jack pine stands heavily infested with dwarf mistletoe. The Alberta Forest Service has continued some operational control trials by hand cutting to remove residual infected jack pines in about 250 ha in the Athabasca Forest.

In **Saskatchewan**, FIDS in 1982 initiated systematic roadside surveys to better establish the intensity and distribution of the disease in the commercial jack pine forests. By the end of 1983, a total of 113 km of roadside surveys through pine stands had been assessed in six locations in central Saskatchewan: Fort-à-la-Corne Provincial Forest, Nisbet Provincial Forest, Prince Albert National Park, forest between Meadow Lake and Glaslyn, Meadow Lake Provincial Park, and the Bear Creek area. Dwarf mistletoe infection (brooming) was found in 19% of the stands surveyed; 8% were rated as moderately to severely infected (one-third or more of pine trees broomed), and 11% were lightly infected (less than one-third of pine trees broomed).

In **Manitoba**, the Manitoba Department of Natural Resources has mapped areas of dwarf mistletoes in spruce and jack pine stands in the Belair Provincial Forest. The intent is for this forest to be placed under dwarf mistletoe management.

WOOD BORERS

Several inquiries were received in 1983 on wood-borer (*Monochamus* and *Tetropium* spp.) and carpenter ant (*Camporotus* sp.) problems in fire-killed timber, new house construction, and jack pine stands surrounding large clear-cuttings.

In **Alberta**, a large volume of lumber salvaged from fire-killed white spruce stands in the Footner Lake Forest caused concern for subsequent marketing due to the presence of worm holes caused mostly by *Monochamus* species. Some of the material had been air dried and contained live larvae. Concern was similarly expressed for salvage of fire-killed timber in the Slave Lake Forest District.

Jack pine mortality in several hectares of residual timber surrounding recent large clear-cuttings near Moose Lake in northwest **Manitoba** was examined. The causal organisms associated with the kill included the sawyer beetle, probably *Monochamus scutellatus* (Say), and at least two bark beetle species, *Ips pini* (Say) and *I. perroti* Swaine. Evidence from field examination indicated the mortality was initiated by heavy crown feeding by large populations of adult *Monochamus* sp., with subsequent invasion of the stems by wood borer and bark beetle species. The mortality had taken place over a 3- to 4-year period.

Information was sought for control of wood borers in salvaged fire-killed logs and for control of carpenter ants in a building of log construction. Prescriptions for control were assessed for each situation and generally included a combination of early inspection, sanitation cutting, prompt utilization, and insecticidal treatment.

NEEDLE DISEASES
Chrysomyxa and *Lophodermella* spp.

Discoloration of 1982 needles of spruces and pines by native needle diseases was widespread in the region. Spruce needle rust (*Chrysomyxa* spp.), affecting black and white spruce needles, and pine needle cast (*Lophodermella concolor* (Dearn) Darker), lodgepole pine needles were common throughout large areas in west-central Alberta. Both

foliage diseases may result in minor growth reductions. *Lophodermella concolor* occurred on natural stands of lodgepole pine near Rocky Mountain House and on planted pine in the districts of Red Deer, Innisfail, Leduc, and Lacombe. Yellow witches' broom, *Chrysomyxa arctostaphyli* Diet., occurred sporadically on black spruce throughout Wood Buffalo National Park and was heavier near Carlson Landing.

LODGEPOLE NEEDLE MINER
Coleotechnites (Eucordylea) starki (Freeman)

The infestation of needle miner in stands of lodgepole pine in the Rocky Mountain national parks continued in 1983. An extensive area of severe foliage discoloration occurred in Banff National Park, centered in the Alexandra River valley. Part of this discoloration was caused by the needle cast, *Lophodermella concolor*. Light infestations of the needle miner also occurred in the Hawk Creek area of Kootenay National Park.

A BIRCH LEAF SKELETONIZER
Lyonetia species (probably *L. prunifoliella* Hübner)

In Yoho National Park, an infestation on birch by *Lyonetia* sp. increased for the third consecutive year. Severe skeletonizing and browning of white birch foliage was noted throughout the park from Kicking Horse River to the west park gate.

LARCH SAWFLY
Pristiphora erichsonii (Hartig)

Moderate-to-severe defoliation of tamarack (eastern larch) stands was recorded for the third consecutive year in the Northwest Territories at locations west of the Fort Simpson airport. Patches of tamarack with moderate-to-severe defoliation also occurred near Louise Falls, Enterprise, and Hay River and between the Fort Smith airport and Salt River. Light defoliation of tamarack occurred in patches throughout the Slave River region of the NWT and Wood Buffalo National Park. An introduced European parasite (*Olesicampe benefactor* Hinz), which was released at one location near Bell Rock near Fort Smith in 1981, does not appear to have spread beyond the release point.

In Saskatchewan, populations of the larch sawfly remained at low or endemic levels. Only traces of tamarack defoliation were detected at a few locations in 1983.

In Manitoba, larch sawfly populations remained very low in areas sampled. Generally light defoliation occurred on tamarack in "The Bog" between Westray and Overflow Bay in west-central Manitoba.

OTHER INSECTS AND DISEASES

Insect or disease	Host	Location	Remarks
Armillaria root rot			
Armillaria mellea (Vahl ex Fries) Kummer	Pine	Prairie provinces	Low but significant tree mortality in natural regeneration and plantations. In Manitoba tree mortality occurred in red pine plantations and was associated with *Ips pini* Say in small patches of recently killed jack pine.
Bark beetle			
Hylurgops rugipennis (Mannerheim)	Jack pine	NWT Alberta	Found associated with *I. pini* in small patches of recently killed jack pine.
Black-headed budworm			
Acleris variana (Fernald)	Spruce	Prairie provinces	Common in Yoho, Jasper, and north end of Banff national parks but caused light damage. Very light defoliation in central Saskatchewan and near Winnipeg and Headingly, Manitoba.
Birch leaf miners			
Fenusa pusilla (Lepeletier) *Heterarthrus nemoratus* (Fallen) *Profenusa thomsoni* (Konow)	Birch species	Prairie provinces	Continued to cause light-to-severe foliage injury in urban and forest areas. Severe damage occurred in Riding Mountain National Park, Grand Rapids, and northwestern Manitoba.
Chemical injury	Several species	Prairie provinces	A notable increase in reports of mortality of and injury to nontarget trees by chemicals, especially soil sterilants in urban areas.
Comandra blister rust			
Cronartium comandrae Peck	Pine	Alberta	Low level of infection in pine regeneration areas.
Cytospora canker			
Cytospora chrysosperma Pers. ex Fx.	Poplar	Alberta Saskatchewan	Common on native trees and hybrid poplar shelterbelts in several areas.

Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
European spruce sawfly *Gilpinia hercyniae* (Hartig)	Spruce	Manitoba	Low populations in southeastern Manitoba with little spread beyond its previous distribution near Winnipeg.
Fall cankerworm *Alsophila pometaria* (Harris)	Manitoba maple White elm	Manitoba Saskatchewan Alberta	Patches of moderate-to-severe defoliation common in southern Manitoba, central Saskatchewan, and southern Alberta.
Fire blight *Erwinia amylovora* (Burrill) Winslow *et al.*	Apple Cotoneaster Crab apple Hawthorn Mountain ash	Major urban centers	A slight increase of infections on mountain ash and cotoneaster in Saskatchewan and stable on other hosts and in other urban areas in the provinces
Frost damage	Many species	Prairie provinces NWT	Frost damage was common in several areas. Extensive patches of mortality and damage to aspen and willow occurred in the NWT. Damage mainly to poplars was extensive in southwest Saskatchewan.
Hail damage	Many species	Saskatchewan NWT	Numerous reports of hail damage, particularly in Prince Albert area. Red foliage caused by hail damage was common on young balsam firs in Prince Albert National Park. Frequent sightings of broken tops and branch dieback occurred in the Fort Liard area.
Hypoxylon canker *Hypoxylon mammatum* (Wahlenberg) J.H. Miller	Aspen	Prairie provinces	Light-to-moderate infection common throughout central areas.

Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
Introduced pine sawfly *Diprion similis* (Hartig)	Scots pine	Manitoba	Light-to-moderate defoliation in plantations at Birds Hill Provincial Park and West Hawk Lake. Light defoliation on ornamentals at Falcon Lake.
Larch casebearer *Coleophora laricella* (Hübner)	Larch	Manitoba	Low populations east of Sprague, Manitoba (same as in 1982).
Lodgepole terminal weevil *Pissodes terminalis* Hopping	Pine	Alberta Saskatchewan	Infestations are common on young trees throughout the provinces. Light infestations occurred in Jasper National Park. Survey of a jack pine plantation in the Gem Lakes area, Saskatchewan, indicated 27% of the trees had terminal shoot damage. Generally, up to 40% (accumulated over more than 1 year) of young jack pines had shoot damage in several plantations in Saskatchewan.
Pear sawfly *Caliroa cerasi* (Linnaeus)	Mountain ash Cotoneaster Apple Plum	Alberta Saskatchewan	Severe injury throughout central Saskatchewan and in the Lloydminster area. Light-to-moderate injury reported from several locations in Alberta.
Pine engraver *Ips pini* (Say)	Jack pine	Prairie provinces	Small isolated patches of dead and dying pines in the Slave River area and extensive areas in northeastern Alberta, assumed to be caused by *I. pini*.
Pine root collar weevil *Hylobius warreni* Wood	Pine	Prairie provinces	Occurred in low numbers in pine and spruce natural regeneration and plantations.

Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
Pinewood nematode *Bursaphelenchus xylophilus* (Steiner and Buhrer) Nicle	Jack pine	Manitoba	First identified from 2 dead jack pines in 1982, the nematode was identified from an additional 10 dying or dead trees attacked by *Monochamus* spp. in the same dwarf mistletoe-infested stand in the Belair Provincial Forest (Keith Knowles, MDNR, personal communication 1983).
Pitch nodule maker *Petrova albicapitana* (Busck) *P. metallica* (Busck)	Jack pine Lodgepole pine	Prairie provinces NWT	Primarily *P. albicapitana* caused numerous red tops and branches on young pine trees.
Rabbit damage	Lodgepole pine Jack pine Spruce	Prairie provinces	Light tree mortality near Pine Lake, Wood Buffalo National Park. Very light throughout the provinces.
Red belt injury	Lodgepole pine	Alberta	Moderate-to-severe injury to limber pine in the Siffleur Wilderness area and Clearwater-Rocky Forest. Severe along the valley of Blakiston Creek from Crandell campground to Red Rock Canyon, Waterton Lakes National Park.
Scleroderris canker *Gremmeniella abietina* (Lagerberg) Morelet	Lodgepole pine	Alberta	Found only in known areas in Jasper National Park.
Silver leaf *Stereum purpureum* (Persoon) Fries	Mountain ash Apple Cotoneaster Other species	Urban centers and farmsteads	Continued to be a common problem in urban areas and farmsteads.
Spruce gall aphids *Adelges cooleyi* (Gillette) *Pineus similis* (Gillette) *Pineus pinifoliae (Fitch)*	Spruce Pine	Prairie provinces NWT	Damage light but common in several areas. Aphids on pine, the secondary host, increased in urban areas.
Spruce spider mite *Oligonychus ununguis* (Jacobi)	Spruce Juniper Cedar	Prairie provinces	Continued as the most reported spruce pest in urban areas.

Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
Two-year-cycle spruce budworm *Choristoneura biennis* Freeman	Alpine fir Engelmann spruce	B.C.	Light damage in northern Kootenay National Park.
Western gall rust *Endocronartium harknessii* (J.P. Moore) Y. Hiratsuka	Lodgepole pine Jack pine	Prairie provinces NWT	Common in young pine regeneration and plantations.
White pine weevil *Pissodes strobi* (Peck)	Spruce Pine	Prairie provinces	Infested dead tops were common on young trees throughout the region. Light infestations occurred in Wood Buffalo National Park. Topkill also occurred on pines and spruces in several provincial nurseries.
Willow leaf miner *Lyonetia* sp.	Willow	Prairie provinces NWT	Patches of moderate-to-severe damage common in central Manitoba; light-to-moderate damage in southern Manitoba. Light to severe in many scattered areas in Saskatchewan and Alberta. Moderate-to-severe leaf mining was widespread in the NWT.
Winter drying	Several species	Prairie provinces	Light-to-severe damage occurred sporadically on several conifers.
Yellow-headed spruce sawfly *Pikonema alaskensis* (Rohwer)	Spruce	Prairie provinces NWT	Generally, light injury occurred throughout the region. Moderate-to-severe patches found in Wood Buffalo National Park and in urban areas in southern Alberta. Moderate-to-severe defoliation of scattered white spruce regeneration occurred in central Manitoba. Widespread light-to-severe defoliation of single trees occurred in Saskatchewan.

SELECTED PUBLICATIONS AND REPORTS

The following reports or publications produced recently by the Forest Insect and Disease Survey and other staff at the Northern Forest Research Centre may be of interest to readers of this report.

Hall, R.H.; Still, G.N.; Crown, P.H. 1983. Mapping the distribution of aspen defoliation using Landsat color composities. Can. J. Remote Sensing 9(2):86-91.

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